

## CLAIMS

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## What Is Claimed Is:

- 10       1. A method of enhancing image permanence of ink-jet images printed  
on ink-jet media, comprising:
- (a) modifying a surface of a ceramic pigment with a modifying group selected from the group consisting of a fixer group, a stabilizer group, and combinations thereof;
  - 15       (b) coating a media substrate with the ceramic pigment to form a coated media substrate; and
  - (c) ink-jetting an ink-jet ink in the form of an image on the coated media substrate, wherein a composition of the ink-jet ink is interactive with at least one modifying group, thereby providing enhanced image permanence.
- 20       2. A method as in claim 1, wherein the ceramic pigment comprises silica.
- 25       3. A method as in claim 1, wherein the ceramic pigment comprises alumina.
4. A method as in claim 1, wherein the ceramic pigment comprises titania or zirconia.
- 30       5. A method as in claim 1, wherein the ceramic pigment comprises an organo-metallic material.

6. A method as in claim 1, wherein the ceramic pigment is modified by at least two different modifying groups.

7. A method as in claim 6, wherein the multiple modifying groups include  
5 at least one fixer and at least one photo-stabilizer.

8. A method as in claim 1, wherein the modifying group is a cationic fixer ligand selected from the group consisting of primary amines, secondary amines, tertiary amines, polyamines, quaternary ammoniums, and alkali earth  
10 metals.

9. A method as in claim 1, wherein the modifying group is an anionic fixer group selected from the group consisting of carboxylates and sulfonates.

15 10. A method as in claim 1, wherein the modifying group is a stabilizer group selected from the group consisting of free radical quenchers, anti-oxidants, anti-ozonants, and photon energy absorbers.

11. A method as in claim 1, wherein the modifying group is a stabilizer  
20 group selected from the group consisting of phenols, substituted phenols, amines, alcohols, polyols, sugars, sugar derivatives, hydroxyamines, amine-oxides, sulfur-containing inorganic salts, amides, polyamides, urea, sulfur-containing heterocyclics, nitrogen-containing heterocyclics, sulfur- and nitrogen-containing heterocyclics, organic acids, and combinations thereof.

25 12. A method as in claim 1, wherein the coating step occurs after the modifying step.

13. A method as in claim 1, wherein the modifying step occurs after the  
30 coating step.

14. A method as in claim 1, wherein the modifying group is attached to the ceramic pigment surface through a silane group.

5 15. A method as in claim 1, wherein the modifying group is attached to the ceramic pigment through a siloxane group.

16. A system for producing permanent ink-jet ink images, comprising:  
(a) a media substrate, having a porous coating coated thereon, said porous coating comprising a modified ceramic pigment; and  
10 (b) an ink-jet ink comprising a composition configured for interacting with the modifying group portion of the ligand-modified ceramic pigment upon printing the ink-jet ink onto the porous coating.

15 17. A system as in claim 16, wherein the composition is an anionic dye.

18. A system as in claim 17, wherein the modified ceramic pigment comprises a cationic fixer group covalently attached to the ceramic pigment.

20 19. A system as in claim 18, wherein the modified ceramic pigment further comprises a stabilizer group covalently attached to the ceramic pigment.

20. A system as in claim 16, wherein the modified ceramic pigment comprises a stabilizer group covalently attached to the ceramic pigment.

25 21. A system as in claim 19, wherein the fixer group and the stabilizer group are commonly attached to the ceramic pigment through a silane or siloxane spacer group.

30 22. A porous coated media sheet, comprising:  
(a) a media substrate, having coated thereon

(b) a porous coating comprising a modified ceramic pigment including a fixer group and a stabilizer group, each covalently attached to the ceramic pigment.

5           23. A porous media sheet as in claim 22, wherein the fixer group and the stabilizer group are each attached to the ceramic pigment through a silane or siloxane spacer group.

10           24. A porous media sheet as in claim 23, wherein the fixer group and the stabilizer group are each attached to the ceramic pigment through the same silane or siloxane spacer group.

15           25. A porous coated media sheet as in claim 22, wherein the fixer group is selected from the group consisting of primary amines, secondary amines, tertiary amines, polyamines, quaternary ammoniums, alkali earth metals, carboxylates, and sulfonates.

20           26. A porous coated media sheet as in claim 22, wherein the stabilizer group is selected from the group consisting of phenols, substituted phenols, amines, alcohols, polyols, sugars, sugar derivatives, hydroxyamines, amine-oxides, sulfur-containing inorganic salts, amides, polyamides, urea, sulfur-containing heterocyclics, nitrogen-containing heterocyclics, sulfur- and nitrogen-containing heterocyclics, ascorbic acid, and combinations thereof.